

Notice of Allowability

Application No.

09/836,281

Applicant(s)

RIESS ET AL.

Examiner

Art Unit

Kandasamy Thangavelu

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 17 January 2006.
2. ☒ The allowed claim(s) is/are 1-57.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date ____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date ____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input checked="" type="checkbox"/> Other <u>Clean copy of allowed claims.</u> |

DETAILED ACTION

Introduction

1. This communication is in response to the Applicants' communication dated January 17, 2006. Claims 1, 6-8, 10, 19, 23-25, 30-34, 41-43, 45-47, 50-55 and 57 were amended. Claims 1-57 of the application are pending.

Examiner's Amendment

2. Authorization for this examiner's amendment was given in a telephone interview with Mr. Robert Hails, Jr. on February 3, 2006.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

3. The application has been amended as follows:

4. In the claims:

In claim 1, Line 1, "method"

has been changed to

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-- method for use in a communication system for transmitting symbols of a high order constellation--.

In claim 2, Line 7, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 9, Line 4, " $y_{1_{n-i}}^2$ and $y_{2_{n-i}}^2$ "

has been changed to

-- $y_{1_{n-i}}$ and $y_{2_{n-i}}$ --.

In claim 10, Lines 1-2, "symbols, comprising, for a captured sample y_n recovered from a communication channel:"

has been changed to

-- symbols for use in a communication system for transmitting symbols of a high order constellation, comprising:

for a captured sample y_n recovered from a communication channel:

initially setting a reliability factor to zero;--.

In claim 10, Line 9, "iteration;"

has been changed to

-- iteration; and --.

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In claim 12, Lines 2-3, “predetermined coefficient c_i ”

has been changed to

-- coefficient c_i , representing any prior knowledge of intersymbol interference effects--.

In claim 19, Lines 1-2, “symbols, comprising, for a captured sample recovered from a communication channel,”

has been changed to

-- symbols, for use in a communication system for transmitting symbols of a high order constellation comprising:

for a captured sample recovered from a communication channel:--.

In claim 19, Line 4, “limit,”

has been changed to

-- limit, and --.

In claim 21, Lines 1-2, “comprising determining a rate at which reliable symbols are identified,”

has been changed to

-- comprising:

determining a rate at which reliable symbols are identified, and --.

In claim 25, Line 2, “at a receiver”

has been changed to

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-- for use at a receiver of a communication system for transmitting symbols of a high order constellation --.

In claim 29, Line 1, "data decoder"

has been changed to

-- data decoder for use in a communication system for transmitting symbols of a high order constellation --.

In claim 29, Lines 3-4, "estimated to have been corrupted least by intersymbol interference ("ISI")"

has been changed to

-- estimated to be located in a correct decision region of a corresponding source symbol--.

In claim 29, Line 5, "generate ISI metrics"

has been changed to

-- generate intersymbol interference (ISI) metrics --.

In claim 30, Line 1, "method"

has been changed to

-- method for use in a communication system for transmitting symbols of a high order constellation --.

In claim 30, Lines 3-4, "estimated to have been corrupted least by effects of the communication channel"

has been changed to

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-- estimated to be located in a correct decision region of their corresponding source symbols --.

In claim 32, Line 6, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 33, Line 6, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 34, Line 4, " $y_{1_{n-i}}^2$ and $y_{2_{n-i}}^2$ "

has been changed to

-- $y_{1_{n-i}}$ and $y_{2_{n-i}}$ --.

In claim 34, Line 7, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 40, Line 1, "equalizer"

has been changed to

-- equalizer for use in a communication system for transmitting symbols of a high order constellation --.

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In claim 40, Lines 4-5, “captured samples have been corrupted least by channel effects”
has been changed to

-- captured samples are located in a correct decision region of their corresponding source
symbols --.

In claim 42, Line 7, “a coefficient”

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 43, Line 4, “ $y_{1_{n-i}}^2$ and $y_{2_{n-i}}^2$ ”

has been changed to

-- $y_{1_{n-i}}$ and $y_{2_{n-i}}$ --.

In claim 43, Line 7, “a coefficient”

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 44, Line 1, “receiver”

has been changed to

-- receiver for use in a communication system for transmitting symbols of a high order
constellation --.

In claim 44, Lines 7-8, “have been corrupted least by channel effects, the identified
samples being reliable symbols”

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has been changed to

-- be located in a correct decision region of their corresponding source symbols --.

In claim 46, Line 7, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 47, Line 4, " $y_{1_{n-i}}^2$ and $y_{2_{n-i}}^2$ "

has been changed to

-- $y_{1_{n-i}}$ and $y_{2_{n-i}}$ --.

In claim 47, Line 7, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 49, Line 1, "transmission system"

has been changed to

-- data communication system --.

In claim 49, Lines 7-8, "corrupted least by intersymbol interference"

has been changed to

-- located in a correct decision region of their corresponding source symbols --.

In claim 51, Line 7, "a coefficient"

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has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 52, Line 4, " $y_{1_{n-i}}^2$ and $y_{2_{n-i}}^2$ "

has been changed to

-- $y_{1_{n-i}}$ and $y_{2_{n-i}}$ --.

In claim 52, Line 7, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

Replace claim 53 with:

53. A computer readable recording medium having stored thereon instructions that, when executed, cause a processor to identify reliable symbols from captured samples received by a system for use in communicating data via a high order constellation by a process comprising:

calculating a reliability factor of a captured sample from values of a plurality of samples proximate to the captured sample, and

if the reliability factor is less than a predetermined limit, designating the captured sample as a reliable symbol.

In claim 54, Line 7, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

In claim 55, Line 4, " $y_{1_{n-i}}^2$ and $y_{2_{n-i}}^2$ "

has been changed to

-- $y_{1_{n-i}}$ and $y_{2_{n-i}}$ --.

In claim 54, Line 7, "a coefficient"

has been changed to

-- a coefficient representing any prior knowledge of intersymbol interference effects--.

Replace claims 56 and 57 with:

56. A computer readable recording medium having stored thereon instructions that, when executed, cause a processor to correct channel effects in captured samples received by a system for use in communicating data via a high order constellation by a process comprising:

identifying reliable symbols from a string of captured samples, the reliable symbols being the captured samples which are estimated to be located in a correct decision region of their corresponding source symbols,

calculating channel effects based on the reliable symbols and samples proximate thereto,
and

correcting the captured samples based on the channel effects.

57. A method for transmitting symbols of a high order constellation, of decoding a string of captured samples recovered from a communication channel comprising:

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identifying reliable symbols from the string of captured samples, the reliable symbols being the captured samples which are estimated to be located in a correct decision region of their corresponding source symbols,

calculating channel effects based on the reliable symbols and samples proximate thereto, estimating transmitted symbols from remaining captured samples based on the channel effects, and

outputting the estimated symbols as a decoded data signal.

A clean copy of allowed claims is attached.

Reasons for Allowance

5. Claims 1-57 of the application are allowed over prior art of record.

6. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

(1) systems and methods for communicating radiophone communications over a radiophone communication channel; methods for achieving a desired bit error rate without requiring a complex optimal estimating filter; the transfer characteristic of the channel is estimated from the predetermined pilot symbols and a data sequence including data corresponding to both the pilot symbols and the communication symbols; the method uses an

iterative estimation of information symbols and the channel characteristic; estimates of information symbols are generated from previously estimated information symbols and the newly estimated information symbols are used to generate new estimates of the channel characteristic; generating a group of information symbols data corresponding to a group of information symbols adjacent to previously estimated information symbols; the identified group of symbols is the one for which the estimated error probability is less than a predetermined threshold (**Hassan**, U. S. Patent 5,901,185);

(2) decoding information symbols from symbol modulated radio signal; the decoder includes a channel estimator to estimate the coefficients of the channel through which the signal is propagated; a signal predictor combines the channel estimates with the corresponding samples of the signal to obtain a likelihood indication; a maximum likelihood sequence estimator is used to compensate for the ISI effects; the maximum likelihood or viterbi algorithm for decoding an information symbol modulated signal comprises sampling the signal to obtain samples that each depend on a limited number of sequential information symbols; the hypothesized sequences are used to predict the sample value; the method predicts an expected value of signal samples for each of the hypothesized sequences and compares the actual values of signal samples with the predicted values of signal samples to determine a likelihood value for each of the sequences; the decoder comprises a maximum likelihood sequence estimator; a sequence of complex vector values are produced , each one being a weighted sum of several adjacent complex symbol values; the weighting factors are channel coefficients determined from the received signals by correlating with the known symbols included in the transmission (**Dent**, U. S. Patent 6,347,125); and

(3) a decoding circuit for receivers in mobile communication systems; the method of estimating the transmitted signal correctly even when the transmitted signal contains much interference; the decoding circuit contains a reliability measurement unit for calculating the reliability value of the estimated amplitude and phase in the transmission lines; an interpolation unit for compensating the phase of information symbols by deciding a method of interpolation on the basis of reliability; a coherent detection unit which detects the signal using the interpolated estimation value; a decision unit for identifying the output from the coherent detection unit on the basis of its phase; the interpolation method is decided based on the reliability; the threshold supply unit supplies the reliability generation unit with a prescribed threshold; the reliability is set to 1 when the power from the power calculation unit is greater than the threshold and it is set to zero when the power is less than the threshold (**Komatsu**, U. S. Patent 6,560,272).

None of these references taken either alone or in combination with the prior art of record discloses a reliable symbol identification method for use in a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 1) “calculating a reliability factor of a captured sample from values of a plurality of samples in proximity to the captured sample, wherein the captured sample and the plurality of other samples represent a data signal received from a communication channel, and

if the reliability factor is less than a predetermined limit, designating the captured sample as a reliable symbol”.

None of these references taken either alone or in combination with the prior art of record discloses a method of identifying reliable symbols for use in a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 10) “adding to the reliability factor a value based on another captured sample y_{n-i} also recovered from the communication channel,

if the reliability factor exceeds a predetermined limit, disqualifying the captured sample as a reliable symbol,

otherwise, incrementing i and, if $i=0$, re-incrementing i for a subsequent iteration; and thereafter, unless the captured symbol has been disqualified, designating the captured sample as a reliable symbol”.

None of these references taken either alone or in combination with the prior art of record discloses a method of identifying reliable symbols, for use in a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 19) “determining whether any value of a plurality of neighboring samples also recovered from the communication channel is within a predetermined limit, and

if none of the values exceed the predetermined limit, designating the captured sample as a reliable symbol”.

None of these references taken either alone or in combination with the prior art of record discloses a method of detecting reliable symbols within a sample data signal for use at a receiver

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of a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 25) “identifying a sequence of sample values having values within a predetermined limit, and
designating a sample adjacent to the sequence as a reliable symbol”.

None of these references taken either alone or in combination with the prior art of record discloses a data decoder for use in a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 29) “a reliable symbol detector to detect reliable symbols from a sequence of captured samples, the reliable symbols being the captured samples which are estimated to be located in a correct decision region of a corresponding source symbol”.

None of these references taken either alone or in combination with the prior art of record discloses an equalization method for use in a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 30) “identifying reliable symbols from a string of captured samples recovered from a communication channel, the reliable symbols being the captured samples which are estimated to be located in a correct decision region of their corresponding source symbols”.

None of these references taken either alone or in combination with the prior art of record discloses an equalizer for use in a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 40) “a reliable symbol detector in communication with the buffer memory, the detector to estimate which samples from a sequence of captured samples are located in a correct decision region of their corresponding source symbols”.

None of these references taken either alone or in combination with the prior art of record discloses a receiver for use in a communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 44) “a reliable symbol detector in communication with the buffer memory to identify which of the stored captured samples are likely to be located in a correct decision region of their corresponding source symbols”.

None of these references taken either alone or in combination with the prior art of record discloses a data communication system for transmitting symbols of a high order constellation, specifically including:

(Claim 49) “identifying reliable symbols from the captured samples, the reliable symbols being those captured samples that are estimated to be located in a correct decision region of their corresponding source symbols”.

None of these references taken either alone or in combination with the prior art of record discloses a computer readable recording medium having stored thereon instructions that, when executed, cause a processor to identify reliable symbols from captured samples received by a system for use in communicating data via a high order constellation, specifically including:

(Claim 53) “calculating a reliability factor of a captured sample from values of a plurality of samples proximate to the captured sample, and

if the reliability factor is less than a predetermined limit, designating the captured sample as a reliable symbol”.

None of these references taken either alone or in combination with the prior art of record discloses a computer readable recording medium having stored thereon instructions that, when executed, cause a processor to correct channel effects in captured samples received by a system for use in communicating data via a high order constellation, specifically including:

(Claim 56) “identifying reliable symbols from a string of captured samples, the reliable symbols being the captured samples which are estimated to be located in a correct decision region of their corresponding source symbols,

calculating channel effects based on the reliable symbols and samples proximate thereto”.

None of these references taken either alone or in combination with the prior art of record discloses a method for transmitting symbols of a high order constellation, of decoding a string of captured samples recovered from a communication channel, specifically including:

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(Claim 57) "identifying reliable symbols from the string of captured samples, the reliable symbols being the captured samples which are estimated to be located in a correct decision region of their corresponding source symbols,

calculating channel effects based on the reliable symbols and samples proximate thereto".

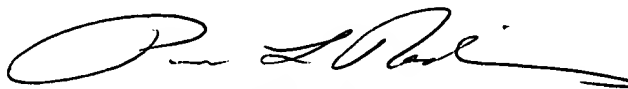
7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard, can be reached on 571-272-3749. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

K. Thangavelu
Art Unit 2123
February 3, 2006


Paul L. Rodriguez 2/6/06
Primary Examiner
Art Unit 2125